

WHAT IS CLAIMED:

1. A composition for use with cement or concrete as a dispersant, comprising:

a polymer comprised of the polymerization product of monomer units A and B, wherein the monomer unit A is a repeating unit after polymerization of a carboxylate or carboxylate derivative, and the monomer unit B is a repeating unit after polymerization comprising a sulfate end group, whereby the polymer has a sulfate end group covalently bonded thereto.

2. The composition as defined in claim 1, wherein monomer unit B is Allyloxypolyethyleneglycol ammonium sulfate (APES-n) and n is an integer in a range of from about 1 to about 150 representing the moles of alkoxyating agent added to each mole of allyl alcohol during formation of the Allyloxypolyethyleneglycol ammonium sulfate.

3. The composition as defined in claim 2, wherein n is an integer in a range of from about 10 to about 50.

4. The composition as defined in claim 1, wherein the monomer unit B is prepared by ethoxylation, propoxylation, or a combination of thereof of allyl alcohol followed by an addition of sulfamic acid.

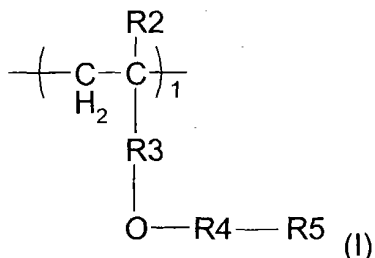
5. The composition as defined in claim 1, wherein monomer unit A is derived from a material selected from the group consisting of carboxylic acid, amido carboxylic acid, C1-C6 alkyl ester of carboxylic acid, C1-C6 alkyl ester of amido carboxylic acid, hydroxylated C1-C6 alkyl ester of carboxylic acid, or hydroxylated C1-C6 alkyl ester of amido carboxylic acid.

6. The composition as defined in claim 5, wherein the material is selected from the group consisting of acrylic acid, methacrylic acid, acrylamide, maleic acid, maleic anhydride, fumaric acid, itaconic acid, 2-acrylamido-2-methylpropanesulfonic acid, and water-soluble salts thereof.

7. The composition as defined in claim 1, wherein the monomeric units A and B are each present in the polymer in range of from about 2 to about 200,000 repeat units.

8. The composition as defined in claim 1, wherein the polymer further comprises the polymerization product of monomer unit C, wherein monomer unit C is selected from the group consisting of polyethylene glycol allyl ether (PEGAE), polypropylene glycol allyl ether (PPGAE), polyethylene glycol/polypropylene glycol allyl ether (PEGPGAE), Hydroxyethylene glycol methylmethacrylate (HEME), and Methoxyethylene glycol methylmethacrylate (MEME).

9. The composition as defined in claim 1, wherein the polymer further comprises the polymerization product of monomer unit C, wherein monomer unit C has the formula (I).

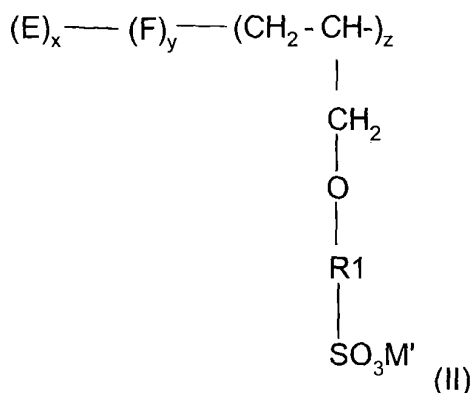


wherein R2 is hydrogen or C1-C4 alkyl; R3 is methyl or C=O; R4 is (CH<sub>2</sub>-CH<sub>2</sub>-O)<sub>n</sub>, (CH<sub>2</sub>-CH(CH<sub>3</sub>)-O)<sub>n</sub>, or a combination thereof, and n is an integer in a range of from about 1 to about 150; R5 is hydrogen, C1-C18 alkyl, or M''(SO<sub>3</sub>), and M'' is a water-soluble cation.

10. The composition as defined in claim 9, wherein monomer unit C is present in the polymer in range of from about 2 to about 200,000 repeat units.

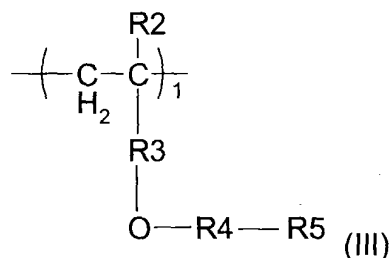
11. The composition as defined in claim 1, wherein the polymer further comprises the polymerization product of monomer unit C, wherein monomer unit C is prepared by ethoxylation, propoxylation, or a combination thereof, of allyl alcohol.

12. A polymeric composition for use with cement or concrete as a dispersant, comprising a repeating unit having the formula (II):



wherein E is a repeating unit after polymerization of a carboxylic acid or derivative thereof, and X is a number in range of from about 2 to about 200,000 repeat units, Y is a number in range of from about 2 to about 200,000 repeat units, Z is a number in range of from about 2 to about 200,000 repeat units;

F has the formula (III),



wherein R2 is hydrogen or C1-C4 alkyl, and R3 is CH<sub>2</sub> or -C=O; R3 is CH<sub>2</sub> or C=O,

R4 is (CH<sub>2</sub>-CH<sub>2</sub>-O)<sub>n</sub> or  $\left( \begin{array}{c} H \\ | \\ -C - C - O- \\ | \quad | \\ H_2 \quad CH_3 \end{array} \right)_n$  or a combination thereof,

and n is an integer in a range of from about 1 to about 150,

R5 is hydrogen, C1-C18 alkyl, or M''(SO<sub>3</sub>), where M'' is a water-soluble cation or an organic amine;

R1 is (-CH<sub>2</sub>-CH<sub>2</sub>-O-)<sub>n</sub> or  $\left( \begin{array}{c} \text{H} \\ | \\ -\text{C}-\text{C}-\text{O}- \\ | \quad | \\ \text{H}_2 \quad \text{CH}_3 \end{array} \right)_n$  or a combination

thereof, and n is an integer in a range of from about 1 to about 150; and

M' is a water soluble cation or an organic amine.

13. The composition as defined in claim 12, wherein E is derived from a material selected from the group consisting of carboxylic acid, amido carboxylic acid, C1-C6 alkyl ester of carboxylic acid, C1-C6 alkyl ester of amido carboxylic acid, hydroxylated C1-C6 alkyl ester of carboxylic acid, and hydroxylated C1-C6 alkyl ester of amido carboxylic acid.

14. The composition as defined in claim 12, wherein E is derived from a material selected from the group consisting of acrylic acid, methacrylic acid, acrylamide, maleic acid, maleic anhydride, fumaric acid, itaconic acid, 2-acrylamido-2-methylpropanesulfonic acid, and water-soluble salts thereof.

15. The composition as defined in claim 12, wherein M' and M'' are the same or different from each other, and are water-soluble cations selected from the group consisting of sodium, potassium, calcium, and ammonium.

16. The composition as defined in claim 12, wherein M' and M'' are the same or different from each other, and are an organic amine selected from the group consisting of triethylamine and morpholine.

17. The composition as defined in claim 12, wherein F is polyethylene glycol allyl ether (PEGAE) when R2 and R5 are hydrogen, R3 is CH<sub>2</sub>, and R4 is (CH<sub>2</sub>-CH<sub>2</sub>-O).

18. The composition as defined in claim 12, wherein F is polypropylene glycol allyl ether (PPGAE) when R2 and R5 are hydrogen, R3 is CH<sub>2</sub>, and R4 is (CH<sub>2</sub>-CH(CH<sub>3</sub>)-O).

19. The composition as defined in claim 12, wherein F is polyethylene glycol/polypropylene glycol allyl ether (PEGPGAE) when R2 and R5 are hydrogen, R3 is CH<sub>2</sub>, and R4 is (CH<sub>2</sub>-CH<sub>2</sub>-O-CH<sub>2</sub>-CH(CH<sub>3</sub>)-O).

20. The composition as defined in claim 12, wherein F is Hydroxyethylene glycol methacrylate (HEME) when R2 is CH<sub>3</sub>, R3 is C=O, R4 is (CH<sub>2</sub>-CH<sub>2</sub>-O), and R5 is hydrogen.

21. The composition as defined in claim 12, wherein F is Methoxyethylene glycol methacrylate (MEME) when R2 is CH<sub>3</sub>, R3 is C=O, R4 is (CH<sub>2</sub>-CH<sub>2</sub>-O), and R5 is CH<sub>3</sub>.

22. The composition as defined in claim 12, wherein a molar ratio of monomeric units is in a range of from about 1 to about 10 for X, from about 0 to about 10 for Y, from about 1 to about 4 for Z.

23. The composition as defined in claim 22, wherein the molar ratio is in a range of from about 2.5 to about 6 for X, from about 0 to about 3 for Y, from about 1 to about 2 for Z.

24. A method of dispersing cement or concrete, comprising:  
adding into a cement formulation comprising cement and water, a polymeric dispersant,

wherein the dispersant comprises a polymeric derivative of a composition selected from the group consisting of carboxylic acid, amido carboxylic acid, C1-C6 alkyl ester of carboxylic acid, C1-C6 alkyl ester of amido carboxylic acid, hydroxylated C1-C6 alkyl ester of carboxylic acid, and hydroxylated C1-C6 alkyl ester of amido carboxylic acid, and has a covalently bonded sulfate moiety as an end group, and thereby improving the rheological properties of the admixture.

25. A concrete or cement admixture, comprising:  
a cementitious material;  
water; and

a dispersant having a sulfate moiety covalently bonded thereto, the dispersant comprising a polymeric derivative of a composition selected from the group consisting of carboxylic acid, amido carboxylic acid, C1-C6 alkyl ester of carboxylic acid, C1-C6 alkyl ester of amido carboxylic acid, hydroxylated C1-C6 alkyl ester of carboxylic acid, and hydroxylated C1-C6 alkyl ester of amido carboxylic acid, whereby the dispersant is operable to improve the rheological properties of the admixture.

26. The admixture as defined in claim 25, wherein the polymeric derivative comprises a water-soluble cation selected from the group consisting of sodium, potassium, calcium, and ammonium.

27. The admixture as defined in claim 25, wherein the polymeric derivative comprises an organic amine selected from the group consisting of triethylamine and morpholine.

28. The admixture as defined in claim 25, wherein the dispersant is present in an amount in a range of from about 0.1 percent (w/w) to about 1.0 percent (w/w).

29. The admixture as defined in claim 28, wherein the dispersant is present in an amount in a range of from about 0.2 percent (w/w) to about 0.32 percent (w/w).



30. The admixture as defined in claim 25, wherein the polymeric derivative is acrylic acid, methacrylic acid, acrylamide, maleic acid, maleic anhydride, fumaric acid, itaconic acid, 2-acrylamido-2-methylpropanesulfonic acid, or a water-soluble salt thereof.

31. A method of forming a polymeric dispersant for use in a concrete or cement admixture, comprising:

polymerizing monomeric units A and B to form a polymer, wherein monomer unit A is a repeating unit after polymerization of a carboxylate or carboxylate derivative, and monomer unit B has a sulfate end group, the polymer having a sulfate moiety covalently bonded thereto.

32. The method as defined in claim 31, further comprising the step of selecting a monomeric unit C, and co-polymerizing monomer unit C with the monomeric units A and B, wherein the monomer unit C is selected from the group consisting of polyethylene glycol allyl ether (PEGAE), polypropylene glycol allyl ether (PPGAE), polyethylene glycol/polypropylene glycol allyl ether (PEGPGAE), Hydroxyethylene glycol methacrylate (HEME), and Methoxyethylene glycol methacrylate (MEME).

33. The method as defined in claim 31, wherein the step of polymerizing comprises forming the polymer as a random co-polymer or a block co-polymer.